REMARKS

In response to the Office Action mailed October 24, 2002, Applicants have amended claims 1, 20 and 41. Claims 1, 4-14, 16-20, 23-33, 35-41 and 44-58 are presented for examination.

Applicants acknowledge with appreciation the telephonic interview granted by the Examiner on February 13, 2003, and for the helpful suggestions discussed during the interview.

Rejection under 35 U.S.C. §112

The Examiner rejected the pending claims under 35 U.S.C. §112, first paragraph.

As amended, the claims require the buffer layer to be epitaxially deposited.

The application as filed does not explicitly state that the process of conditioning the surface of a buffer layer does not substantially change the crystallinity of the buffer layer surface, but, after reading the application, a person of ordinary skill in the art would understand that the process of conditioning the buffer layer surface does not substantially change the crystallinity of the buffer layer surface. (Rupich Decl., ¶8.) The application discloses that the surface of the substrate can have a biaxial or cube texture. (Application, p. 15, line 22-p. 16, line 2; Rupich Decl., ¶8.) The application also discloses that the buffer layer is an epitaxial layer. (Application, p. 22, lines 18-21; id., p. 23, lines 16-24; id., p. 24, lines 8-12; Rupich Decl., ¶8.) The application further discloses that the crystallographic orientation of an epitaxial layer is directly related to the crystallographic orientation of the underlying layer. (Application, p. 2, lines 11-16; Rupich Decl., ¶8.) After reading this information, a person of ordinary skill in the art would understand that, as deposited, the buffer layer surface has substantially the same crystallinity as the substrate surface (e.g., biaxial or cube texture) because the surface of an epitaxial layer takes on the crystallinity of the surface of the layer on which it is deposited. (Rupich Decl., ¶8.) The application further discloses that the conditioned surface has a biaxial or cube texture. (Application, p. 8, lines 7-10; Rupich Decl., ¶8.) Therefore, based on the information disclosed in the application, a person of ordinary skill in the art would understand that the crystallinity of

the buffer layer surface prior to conditioning is substantially the same as the crystallinity of the buffer layer surface after conditioning. (Rupich Decl., ¶8.)

The application describes the morphology of the conditioned surface as being, for example, relatively smooth and as having a high density. (Application, p. 3, line 23-p. 3, line 1; Rupich Decl., ¶9.) The application further discloses that conditioning the surface "affect changes in the surface." (Application, lines 5-12; Rupich Decl., ¶9.) After reading this, a person of ordinary skill in the art would understand that the morphology of a buffer layer surface before conditioning is different from the morphology of the buffer layer surface after conditioning. (Rupich Decl., ¶9.)

In view of the foregoing, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. §112.

Objection under 35 U.S.C. §132

The Examiner objected to the Amendment filed on October 8, 2002 under 35 U.S.C. §132. For the reasons discussed above, Applicants request reconsideration and withdrawal of the objection.

Rejections under 35 U.S.C. §103

The Examiner rejected claims 1, 4-14, 16-19 under 35 U.S.C. §103(a) as being unpatentable over G. Koster et al., Materials Science and Engineering, B56, pp. 209-212 (1998) ("the Koster reference") or N. Tanaka et al., Jpn. J. Appl. Phys., 38, pp. L731-L733 (1999) ("the Tanaka reference") or U.S. Patent No. 6,022,832 ("the Fritzemeier patent") in combination with either U.S. Patent No. 5,534,491 ("the Nakamura patent") or U.S. Patent No. 5,234,901 ("the Saitoh patent"). However, none of these references, alone or in combination, disclose or suggest the methods covered by claims 1, 4-14, 16-19.

The Koster reference is focused on improving the quality of a polished strontium titanate single crystal surface to correct for a miscut. (Koster, p.209; Rupich Decl., ¶11.) Koster states that the polished single crystal surface does not exhibit "a clear texture." (Koster, p. 210; Rupich Decl., ¶11.) The Koster reference discloses two different methods of treating the polished surface. (Koster, p. 209; Rupich Decl., ¶11.) One method involves using "ambient oxygen" at

elevated temperatures. (Koster, p. 209; Rupich Decl., ¶11.) After oxygen exposure, Koster indicates that his "optimal" surface exhibits "a very crystalline surface." (Koster, p. 211; Rupich Decl., ¶11.) Koster's other method involves using an HF etchant. (Koster, p. 210; Rupich Decl., ¶11.) Koster discloses epitaxially growing $SrTiO_3$ on the etched surface, indicating that the etched surface is crystalline. (Koster, p. 211; Rupich Decl., ¶11.) Thus, both of Koster's methods of treating the polished surface result in a change in the crystallinity of the surface. As a result, one of ordinary skill in the art would not have considered the Koster reference if they were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning. (Rupich Decl., ¶11.)

The Tanaka reference discloses a single crystal of a superconductor material (YBCO), and is directed to removing a layer of material damaged while mechanically polishing the crystal surface to yield a YBCO material having a surface with a desired crystallinity. (Tanaka, p. L731-L732; Rupich Decl., ¶12.) Tanaka uses an HCl/methanol etchant to remove the damaged YBCO. (Tanaka, p. L731-L732; Rupich Decl., ¶12.) According to the Tanaka reference, Tanaka's method improves the crystallinity of epitaxial layers deposited on top of the etched surface. (Tanaka, p. L731-L732; Rupich Decl., ¶12.) Thus, Tanaka's method changes the crystallinity of his surface, and so, one of ordinary skill in the art would not have considered the Tanaka reference if they were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning. (Rupich Decl., ¶12.)

The Fritzemeier patent is directed to forming a deposited buffer layer. (Fritzemeier, col. 7, line 48-col. 8, line 11; Rupich Decl., ¶13.) To the extent that Fritzemeier discloses conditioning, it is with respect to removing contaminants from the surface of a metal alloy or substrate, not a deposited buffer layer surface. (Fritzemeier, col. 2, lines 49-55; id., col. 4, lines 14-28; Rupich Decl., ¶13.) These substrates are not deposited; they are formed by other methods, such as rolling and annealing. (Fritzemeier, col. 12, lines 13-16; Rupich Decl., ¶13.) Therefore, one of ordinary skill in the art would not have considered the Fritzemeier reference if they were trying to develop a method of conditioning a buffer layer surface. (Rupich Decl., ¶13.)

The Nakamura patent is directed to removing contaminants from a superconductor layer. (Nakamura, col. 3, lines 40-60; Rupich Decl., ¶14.) To achieve this, the Nakamura patent discloses thermally treating the superconductor layer at temperatures above which the surface will recrystallize and below which the order of crystal of the thin film of oxide superconductor is "disturbed." (Id., col. 4, lines 3-8; Rupich Decl., ¶14.) Thus, Nakamura changes the crystallinity of the surface of the thin film, and so one of ordinary skill in the art would not have considered the Nakamura patent if they were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning. (Rupich Decl., ¶14.)

The Saitoh patent discloses a method designed to "improve" the crystallinity of an oxide superconductor surface. (Saitoh, col. 2, lines 43-50; Rupich Decl., ¶15.) Thus, Saitoh's method changes the crystallinity of the surface being treated. (Rupich Decl., ¶15.) As a result, one of ordinary skill in the art would not have considered the Saitoh patent if they were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning. (Id.)

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Koster reference or the Nakamura patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶17.) Further, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Koster reference with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Koster, p.209; Nakamura, col. 3, lines 25-37; Rupich Decl., ¶17), and because the references disclose that they successfully achieve their respective goals (Koster, p. 212; Nakamura, col. 3, lines 41-54; Rupich Decl., ¶17).

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Koster reference or the Saitoh patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶18.) Moreover, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Koster reference with the methods disclosed in the Saitoh patent because the methods are directed to different goals (Koster, p.209; Saitoh, col. 2, lines 35-40; Rupich Decl., ¶18), and because the references disclose that they

successfully achieve their respective goals (Koster, p. 212; Saitoh, col. 2, line 65-col. 3, line 10; Rupich Decl., ¶18).

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Tanaka reference or the Nakamura patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶18.) In addition, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Tanaka reference with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Tanaka, p. L731; Nakamura, col. 3, lines 25-37; Rupich Decl., ¶19), and because the references disclose that they successfully achieve their respective goals (Tanaka, p. L732-L733; Nakamura, col. 3, lines 41-54; Rupich Decl., ¶19).

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Tanaka reference or the Saitoh patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶20.) Further, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Tanaka reference with the methods disclosed in the Saitoh patent because the methods are directed to different goals (Tanaka, p. L731; Saitoh, col. 2, lines 35-40; Rupich Decl., ¶20), and because the references disclose that they successfully achieve their respective goals (Tanaka, p. L732-L733; Saitoh, col. 2, line 65-col. 3, line 10; Rupich Decl., ¶20).

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Fritzemeier patent or the Nakamura patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶21.) Moreover, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Fritzemeier patent with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Fritzemeier, col. 2, lines 1-11; Nakamura, col. 3, lines 25-37; Rupich Decl., ¶21), and because the references disclose that they successfully achieve their respective goals (Fritzemeier, col. 2, lines 14-18; Nakamura, col. 3, lines 41-54; Rupich Decl., ¶21).

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Fritzemeier patent or the Saitoh patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶22.) In addition, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Fritzemeier patent with the

methods disclosed in the Saitoh patent because the methods are directed to different goals (Fritzemeier, col. 2, lines 1-11; Saitoh, col. 2, lines 35-40; Rupich Decl., ¶22), and because the references disclose that they successfully achieve their respective goals (Fritzemeier, col. 2, lines 14-18; Saitoh, col. 2, line 65-col. 3, line 10; Rupich Decl., ¶22).

Thus, not only is there no suggestion to combine the references, but one skilled in the art would not have even considered the references. Accordingly, Applicants request reconsideration and withdrawal of the rejection of claims 1, 4-14, 16-19 under 35 U.S.C. §103(a).

The Examiner also rejected claims 20, 23-33, 35-41, and 44-58 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,534,214 ("the Konishi patent") in combination with the Nakamura patent. But, neither the Konishi patent nor the Nakamura patent, alone or in combination, disclose or suggest the methods covered by these claims.

The Konishi patent discloses a method of heating a single crystal superconductor (not a deposited buffer layer) so that protrusions are not formed in the surface. (Konishi, col. 1, line 65-col. 3, line 23; Rupich Decl., ¶16.) Therefore, Konishi's process does not change the morphology of the surface. (Rupich Decl., ¶16.) Thus, one of ordinary skill in the art would not have considered the Konishi patent if they were trying to develop a method of conditioning a buffer layer surface so that the morphology of the buffer layer surface before conditioning was different from the morphology of the buffer layer surface after conditioning. (Id.)

As would be understood by one of ordinary skill in the art, there is no suggestion in either the Konishi patent or the Nakamura patent that the methods disclosed in these two references should be combined. (Rupich Decl., ¶23.) Further, one of ordinary skill in the art would not have been motivated to combine the methods disclosed in the Konishi patent with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Konishi, col. 1, line 65-col. 2, line 8; Nakamura, col. 3, lines 25-37; Rupich Decl., ¶23), and because the references disclose that they successfully achieve their respective goals (Konishi, col. 3, lines 20-23; Nakamura, col. 3, lines 41-54; Rupich Decl., ¶23).

Thus, not only is there no suggestion to combine the references, but one skilled in the art would not have even considered the references. In view of the foregoing, Applicants request reconsideration and withdrawal of the rejection of claims 20, 23-33, 35-41, and 44-58 under 35 U.S.C. §103(a).

Attached is a marked-up version of the changes being made by the current amendment.

Applicants believe the application is in condition for allowance. Enclosed is a Petition for a One Month Extension of Time, and a check for the fees associated with this petition. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 2/24/03

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Version with markings to show changes made

In the claims:

Claim 1, 20, and 41 has been amended as follows:

1. (Four times amended) A method of making a multi-layer article, comprising:

epitaxially depositing a first material on a surface of a third material to form a deposited layer of the first material, the first material being a buffer material, the deposited layer of the first material having a surface with a crystallinity and a morphology;

chemically conditioning the surface of the deposited layer of the first material to form a conditioned surface having a crystallinity and a morphology, the crystallinity of the conditioned surface being substantially the same as the crystallinity of the surface of the deposited layer, and the morphology of the conditioned surface being different from the morphology of the deposited layer; and

disposing a layer of a second material on the conditioned surface.

20. (Four times amended) A method of making a multi-layer article, comprising:

epitaxially depositing a first material on a surface of a third material to form a deposited layer of the first material, the first material being a buffer material, the deposited layer of the first material having a surface with a crystallinity and a morphology;

heating, at an oxygen gas pressure of less than about 700 Torr, the surface of the deposited layer of the first material to a temperature at least about 5°C above a temperature selected from the group consisting of a deposition temperature of the layer of the first material and a crystallization temperature of the layer of the first material to form a conditioned surface having a crystallinity and a morphology, the crystallinity of the conditioned surface being substantially the same as the crystallinity of the surface of the deposited layer, and the morphology of the conditioned surface being different from the morphology of the deposited layer; and

disposing a second material on the conditioned surface.

41. (Four times amended) A method of making a multi-layer article, comprising:

epitaxially depositing a first material on a surface of a third material to form a deposited layer of the first material, the first material being a buffer material, the deposited layer of the first material having a surface with a crystallinity and a morphology;

heating the surface of the deposited layer of the first material to a temperature at least about 5°C above a temperature selected from the group consisting of a deposition temperature of the layer of the first material and a crystallization temperature of the layer of the first material to form a conditioned surface having a crystallinity and a morphology, the crystallinity of the conditioned surface being substantially the same as the crystallinity of the surface of the deposited layer, and the morphology of the conditioned surface being different from the morphology of the deposited layer, the first material being disposed on a surface of a polycrystalline material; and

disposing a second material layer on the conditioned surface.